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ABSTRACT

Interpersonal expectancy effects--the unintentional expectations that experimenters, teachers, and authority figures bring to experiments, classrooms, and other situations--can wield significant influence on individuals. Some of the issues surrounding expectancy effects are detailed in this paper. The effect itself has been recreated in experiments with subjects ranging from humans to rats. In one classroom study, children were administered a nonverbal test of intelligence, which was disguised as a test that would predict intellectual "blooming." Their teachers were then told that certain children would show surprising gains in intellectual competence during the next eight months of school. At the end of the school year, the children from whom the teacher had been led to expect the greater intellectual gain showed significantly greater gains than did other children, although the only difference was in the mind of the teacher. Numerous other studies were conducted to measure this Pygmalion effect, and some of these--the 10 Arrow Model and the Four Factor Theory--are examined here. Research has expanded to examine Pygmalion effects in management, in courtrooms, and in nursing homes. In all cases, it appears that much of the mediation in these studies of expectation is occurring by means of unintended nonverbal behavior. (Contains 17 endnotes.) (RJM)

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October 16, 1997

Interpersonal Expectancy Effects: A Forty Year Perspective[a]

Robert Rosenthal

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In the mid 1950s the results of a doctoral dissertation were nearly ruined; it appeared that the student might have treated his experimental subjects in such a way as to lead them to respond in accordance with his experimental hypothesis or expectancy.[1] All of this was quite unwitting, of course, but it did raise a sobering question about the possibility of interpersonal expectancy effects in the psychological laboratory. If it was the student's unintentional interpersonal expectancy effect or his "unconscious experimenter bias" that had led to the puzzling and disconcerting results of his dissertation then presumably we could produce the phenomenon in our own laboratory and with several experimenters rather than just one.

EARLY LABORATORY EXPERIMENTS

The earliest studies were conducted with human subjects. Experimenters obtained ratings of photographs of stimulus persons from their subjects but half the experimenters were led to expect high photo ratings and half were led to expect low photo ratings. In our first several such studies, experimenters expecting higher photo ratings obtained substantially higher photo ratings than did experimenters expecting lower photo ratings.[2]

To investigate the generality of these interpersonal expectancy effects in the laboratory we conducted two studies employing animal subjects. Half the experimenters were told their rats had been specially bred for maze (or Skinner box) brightness and half were told their rats had been specially bred for maze (or Skinner box) dullness. In both experiments when experimenters had been led to expect better learning from their rat

subjects they obtained better learning from their rat subjects.[3]

INTERPERSONAL EXPECTANCY (PYGMALION) EFFECTS IN THE CLASSROOM

If rats became brighter when expected to by their experimenters then it seemed not farfetched to think that children could become brighter when expected to by their teacher. Accordingly, all of the children in the study were administered a nonverbal test of intelligence, which was disguised as a test that would predict intellectual "blooming." The test was labeled as "The Harvard Test of Inflected Acquisition." There were 18 classrooms in the school, three at each of the six grade levels. Within each grade level the three classrooms were composed of children with above average ability, average ability, and below average ability, respectively. Within each of the 18 classrooms approximately 20% of the children were chosen at random to form the experimental group. Each teacher was given the names of the children from his or her class who were in the experimental condition. The teacher was told that these children had scored on the "Test of Inflected Acquisition" such that they would show surprising gains in intellectual competence during the next 8 months of school. The only difference between the experimental group and the control group children, then, was in the mind of the teacher.

At the end of the school year, 8 months later, all the children were retested with the same test of intelligence. Considering the school as a whole, the children from whom the teachers has been led to expect greater intellectual gain showed a significantly greater gain than did the children of the control group.[4]

DOMAINS INVESTIGATED

A dozen years after the Pygmalion in the classroom study was completed, the research literature on interpersonal expectancy effects had broadened to include 345 experiments that could be subsumed under one of eight domains of research. Table 1 shows these domains, gives an example of the type of study subsumed under each domain, and gives the average magnitude of the effect obtained in each domain.[5] After another dozen years had gone by, the overall mean effect size of the 479 studies was found to be a d of .62 or an r of .30.[6,7]

Insert Table 1 about here

PYGMALION EFFECTS: SOCIAL IMPORTANCE

How are we to evaluate the social importance of the average magnitude of the effect of interpersonal expectations? For the meta-analysis of 479 studies we know d = .62, r_{pb} = .30, and r_{pb}^2 = .09, but all three of these effect size estimates suffer from the same problem. That problem is the underestimation of the practical importance of the effect of a behavioral or biomedical intervention. The Binomial Effect Size Display (BESD) was proposed to address the question: What is the effect on the success rate (e.g., survival rate, cure rate, improvement rate, etc.) of any intervention?[8] The BESD displays the change in outcome attributable to the independent variable. Table 2 illustrates the BESD for the overall mean effect size (r = .30) of the meta-analysis of 479 studies of interpersonal self-

fulfilling prophecies and, for comparison, for the results of a recent study of the effects of aspirin in the prevention of heart attacks ($r = .04$).[9]

Insert Table 2 about here

THE 10 ARROW MODEL

For many years the central question in the study of interpersonal expectancy effects was whether there was any such thing. The meta-analytic evidence has answered that question sufficiently so that simple additional replications will add little new knowledge. The central questions in the study of interpersonal expectancy effects have changed so that now the more interesting questions include the specification of the variables that (a) moderate expectancy effects and (b) mediate expectancy effects. Moderator variables are pre-existing variables such as sex, age, and personality that influence the magnitude of interpersonal expectancy effects; mediating variables refer to the behaviors by which expectations are communicated. The basic elements of the 10 arrow model designed to clarify the study of interpersonal expectancy effects are (a) distal independent variables (e.g. stable attributes of the expecter and expectee), (b) proximal independent variables (the expectancy), (c) mediating variables, (d) proximal dependent variables (e.g., outcome measures such as achievement on tests, etc.), and (e) distal dependent variables (longer-term outcome variables). A useful feature of this model is that the 10 arrows of the model represent the types of relationships that can be examined in research on expectancy effects (see Figure 1).

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Insert Figure 1 about here

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These arrows are described in detail elsewhere[10] so we will discuss here only the two links relevant to the topic of mediation: The B-C and C-D arrows. B-C relationships describe the effect the expectancy has on the expecter's behavior, the relationships most often investigated in research on mediation. Equally important to understanding mediation, however, are the C-D relationships between the expecter's behavior and outcome variables. Research bearing on the B-C link tells us which behaviors are induced by a given expectancy, but research bearing on the C-D link assures us that these behaviors affect the expectee so as to create a self-fulfilling prophecy. As is evident, the two types of relationships address different questions, making the B-C/C-D distinction critical. In a detailed series of meta-analyses on the mediation of interpersonal expectancy effects, Harris and Rosenthal acknowledged the B-C/C-D distinction by discussing results for the B-C and C-D links separately.[11]

THE FOUR FACTOR "THEORY"

On the basis of the first 30 or so published studies relevant to mediation, a four-factor "theory" of the mediation of teacher expectancy effects was proposed.[12] Table 3 summarizes these four factors.

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Insert Table 3 about here

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The meta-analyses conducted by Harris and Rosenthal were designed to summarize

many dozens of studies examining either the B-C or C-D links (or both) and to come up with a quantitative estimate of the importance of each of the four factors in the mediation of interpersonal expectancy effects. Table 4 gives the average magnitude

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Insert Table 4 about here

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of the role of each factor separately for the B-C and C-D links. While all four factors received ample support in terms of significance testing, the magnitudes of the effects for the climate and input factors were especially impressive. Teachers appear to teach more and to teach it more warmly to students for whom they have more favorable expectations.

From these results we cannot infer that if we select warmer and more material-presenting teachers our nation's children will learn more. We also cannot infer from these results that training teachers to be warmer and more material-presenting will lead to improved learning on the part of our nation's children. Our results do suggest, however, that conducting the research required to determine the benefits of selection and training for climate (or affect) and input (or effort) may well yield substantial benefits both for science and for society.

LOOKING FORWARD

The most recent work, and that currently in progress, continues to examine the effects of interpersonal expectancy effects in an ever widening circle of contexts. Pygmalion effects in management,[13] in courtrooms,[14] in nursing homes,[15] and in a variety of classrooms[16] are under investigation. We have learned that organizational effectiveness

can be increased by raising leaders' expectations, that juries' verdicts of guilty can be increased by assigning them judges to instruct them who believe the defendant to be guilty, that the depression levels of nursing home residents can be reduced by raising the expectation levels of caretakers, and that teacher expectations can serve as self-fulfilling prophecies in other countries and for more than simply intellectual tasks. In all these cases the mediating variables are receiving special attention with the evidence growing rapidly that much of the mediation is occurring by means of unintended nonverbal behavior.[17]

Acknowledgments

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Notes

1. The details are given in R. Rosenthal, From unconscious experimenter bias to teacher expectancy effects, in Teacher Expectancies, J. G. Dusek, V. C. Hall, and W. J. Meyer, Eds. (Lawrence Erlbaum Associates, Hillsdale, NJ, 1985).

2. R. Rosenthal and K. L. Fode, the problem of experimenter outcome-bias, in Series Research in Social Psychology, D. P. Ray, Ed. (National Institute of Social and Behavioral Science, Washington, D.C., 1961). That this research was received with ambivalence is illustrated by the receipt of two letters on the same day; the first letter rejected the paper for publication in a prestigious APA journal, the second letter announced that the paper had received the AAAS Socio-Psychological Prize for 1960.

3. R. Rosenthal and K. L. Fode, The effect of experimenter bias on the performance of the albino rat, Behavioral Science, 8, 183-189 (1963); R. Rosenthal and R. Lawson, A longitudinal study of the effects of experimenter bias on the operant learning of laboratory rats, Journal of Psychiatric Research, 2, 61-72 (1964).

4. R. Rosenthal and L. Jacobson, Pygmalion in the Classroom (Holt, Rinehart and Winston, New York, 1968). By the time this book appeared there were already dozens of studies showing the effects of interpersonal self-fulfilling prophecies in a wide variety of situations and for a wide variety of dependent variables. Therefore, the results of this experiment were not all that surprising to us. What was surprising to us was the finding that for those children who were not expected to gain much in IQ (because they were in the control group), the more they gained in IQ the more unfavorably they were judged by their

teachers. Apparently there were hazards to unpredicted intellectual growth. Something else that surprised us was the strength of both the favorable and unfavorable reactions to our research. The best known of the criticisms and replies to these criticisms have been summarized in R. Rosenthal, Pygmalion effects: Existence, magnitude, and social importance, Educational Researcher, 16, 37-41 (1987)

5. Effect sizes are expressed both in terms of d and of r. The former is the difference between the experimental and control group divided by the standard deviation of both groups combined. The latter is the point biserial correlation between experimental versus control group status (e.g., coded 1 or 0) and the outcome score (e.g., gain in performance). The effect sizes of Table 1 are based on R. Rosenthal and D. B. Rubin, Interpersonal expectancy effects: The first 345 studies, The Behavioral and Brain Sciences, 3, 377-386 (1978).

6. These meta-analyses are also described in R. Rosenthal, Teacher expectancy effects: A brief update 25 years after the Pygmalion experiment, Journal of Research in Education, 1, 3-12 (1991). For technical details on meta-analytic procedures see R. Rosenthal, Judgment Studies: Design, Analysis, and Meta-Analysis (Cambridge University Press, New York, 1987); R. Rosenthal, Meta-Analytic Procedures for Social Research (revised edition, Sage Publications, Newbury Park, CA, 1991); H. Cooper and L. V. Hedges, Handbook of Research Synthesis, (Russel Sage Foundation, New York, 1994).

7. More specialized meta-analyses are also available for just the effects of interpersonal expectations on pupils' IQ test performance: S. W. Raudenbush, Magnitude of teacher

expectancy effects on pupil IQ as a function of the credibility of expectancy induction: A synthesis of findings from 18 experiments, Journal of Educational Psychology, 76, 85-97 (1984); M. L. Smith, Teacher expectations, Evaluation in Education, 4, 53-55 (1980). Both Raudenbush and Smith found significant overall effects of interpersonal expectations on students' IQ. The mean effect size reported by Smith in units of d was .16; in units of r (the point-biserial correlation between teacher expectancy and pupil IQ), it was .08. (We postpone for the moment a consideration of the practical importance of that effect size.) Raudenbush's more recent meta-analysis (1984) was designed to investigate the relationship between the credibility of the expectancy induction and the magnitude of the teacher expectancy effect on pupil IQ. He found very strong evidence ($r = .67$) that substantial effects of teachers' expectancies could be demonstrated only when the induction of the expectancy was credible, i.e., when teachers had known pupils only two weeks or less. For the seven studies in which teachers had known pupils one week or less, as was the case for the Pygmalion study, the mean effect size d was .29 and r was .14.

8. R. Rosenthal and D. B. Rubin, A simple general purpose display of magnitude of experimental effect, Journal of Educational Psychology, 74, 166-169 (1982).

9. Steering Committee of the Physicians Health Study Research Group, Preliminary report: Findings from the aspirin component of the ongoing physicians' health study, The New England Journal of Medicine, 318, 262-264 (1988). This study, with its effect size $r = .04$ and $r^2 = .00$ was discontinued on the grounds that it would be unethical to continue depriving placebo control participants of the beneficial effects of aspirin given the effect

size r of .04 (r^2 = .00). Table 2 shows an r of .04 to cut the rate of unfavorable outcomes e.g., heart attacks, by 4 per 100. To employ the BESD we compute the effect size r and add r/2 to .50 to get the treatment group success rate. We get the control group success rate by subtracting the quantity r/2 from .50.

10. R. Rosenthal, Pavlov's mice, Pfungst's horse, and Pygmalion's PONS: Some models for the study of interpersonal expectancy effects, in The Clever Hans Phenomenon, T. A. Sebeok and R. Rosenthal, Eds. (Annals of the New York Academy of Sciences, 1981); also see Note 1.

11. M. J. Harris and R. Rosenthal, Mediation of interpersonal expectancy effects: 31 meta-analyses, Psychological Bulletin, 97, 363-386 (1985) and, updated, M. J. Harris and R. Rosenthal, Four factors in the mediation of teacher expectancy effects, in The Social Psychology of Education, R. S. Feldman, Ed. (Cambridge University Press, New York, 1986). It should be noted that although all the arrows of time point to the right (or to the future) the arrows may usefully be viewed also as often going in both directions. Thus, improved student performance (variable type d) can affect subsequent teacher expectations (variable type b) and subsequent teacher behavior toward the student (variable type c).

12. R. Rosenthal, The mediation of Pygmalion effects: A four factor "theory", Papua New Guinea Journal of Education, 9, 1-12 (1973); R. Rosenthal, On the Social Psychology of the Self-Fulfilling Prophecy: Further Evidence for Pygmalion Effects and their Mediating Mechanisms (MSS Modular Publications, New York, 1974).

13. D. Eden, Pygmalion in Management (Lexington Books, MA, 1990).

14. P. D. Blanck, R. Rosenthal, A. J. Hart, and F. Bernieri, The measure of the judge: An empirically-based framework for exploring trial judges' behavior, Iowa Law Review, 75, 653-684 (1990), and A. M. Halverson, M. Hallahan, A. J. Hart, and R. Rosenthal, Reducing the biasing effects of judges' nonverbal behavior with simplified jury instruction, Journal of Applied Psychology, 82, 590-598 (1997).

15. L. A. Learman, J. Avorn, D. E. Everitt, and R. Rosenthal, Pygmalion in the nursing home: The effects of caregiver expectations on patient outcomes, Journal of the American Geriatrics Society, 38, 797-803 (1990).

16. E. Babad, Teacher expectancies and nonverbal behavior, in Applications of Nonverbal Behavioral Theories and Research, R. S. Feldman, Ed. (Lawrence Erlbaum Associates, Hillsdale, NJ, 1992).

17. N. Ambady and R. Rosenthal, Then slices of expressive behavior as predictors of interpersonal consequences: A meta-analysis, Psychological Bulletin, 111, 256-274 (1992).

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Recommended Reading

R. Rosenthal, Experimenter Effects in Behavioral Research (Appleton-Century-Crofts, New York, 1966; enlarged edition, Irvington, New York, 1976).

R. Rosenthal, & L. Jacobson, Pygmalion in the Classroom (Holt, Rinehart and Winston, New York, 1968; expanded edition, Irvington, New York, 1992).

Table 1

Magnitude of Interpersonal Expectancy Effects

in Eight Research Domains (After Rosenthal & Rubin, 1978)

	Mean Effect Size		Example of Type of Study
Domain	d	r	
Laboratory Interviews	.14	.07	Effects of sensory restriction
Reaction Time	.17	.08	Latency of word associations
Learning and Ability	.54	.26	IQ test scores; verbal conditioning
Person Perception	.55	.27	Perception of others' success
Inkblot Tests	.84	.39	Ratio of animal to human Rorschach responses
Everyday Situations	.88	.40	Symbol learning; athletic performance
Psychophysical Judgments	1.05	.46	Ability to discriminate tones
Animal Learning	1.73	.65	Learning in mazes and Skinner boxes
Weighted Mean	.70	.33	
Unweighted Mean	.74	.35	
Median	.70	.33	

Table 2

Binomial Effect Size Displays (BESD) for rs of .30 and .04

that Account for "Only" 9% and "0"% of the Variance, Respectively

		Treatment result		
Effect size	Condition	Favorable	Unfavorable	Σ
Pygmalion Effects				
r = .30 (d = .62)	Treatment	65	35	100
(r^2 = .09)	Control	35	65	100
N = 479 studies	Σ	100	100	200
Aspirin Effects				
r = .04 (d = .08)	Treatment	52	48	100
(r^2 = .00)	Control	48	52	100
N = 22,000 participants	Σ	100	100	200

Table 3

Summary of Four Factors in the Mediation of Teacher Expectancy Effects

Factor		Brief Summary of the Evidence
Central Factors		
1.	Climate (Affect)	Teachers appear to create a warmer socio-emotional climate for their "special" students. This warmth appears to be at least partially communicated by nonverbal cues.
2.	Input (Effort)	Teachers appear to teach more material and more difficult material to their "special" students.
Additional Factors		
3.	Output	Teachers appear to give their "special" students greater opportunities for responding. These opportunities are offered both verbally and nonverbally (e.g., giving a student more time in which to answer a teacher's question).
4.	Feedback	Teachers appear to give their "special" students more differentiated feedback, both verbal and nonverbal, as to how these students have been performing.

Table 4

Meta-Analytically Derived Average Correlations Indexing the Effect Sizes of the Four Factor Theory (After Harris & Rosenthal, 1986)

Factor	Correlation Between Expectation and Expecter's Behavior (B-C Link)	Correlation Between Behavior of Expecter and Response of Expectee (C-D Link)	Geometric Mean Correlation
1. Climate (Affect)	.23	.36	.29
2. Input (Effort)	.26	.28	.27
3. Output	.18	.16	.17
4. Feedback	.13	.08	.10

Note: All correlations are significantly greater than zero at $p < .002$. The correlation between the magnitudes of the average B-C and C-D links is .88.

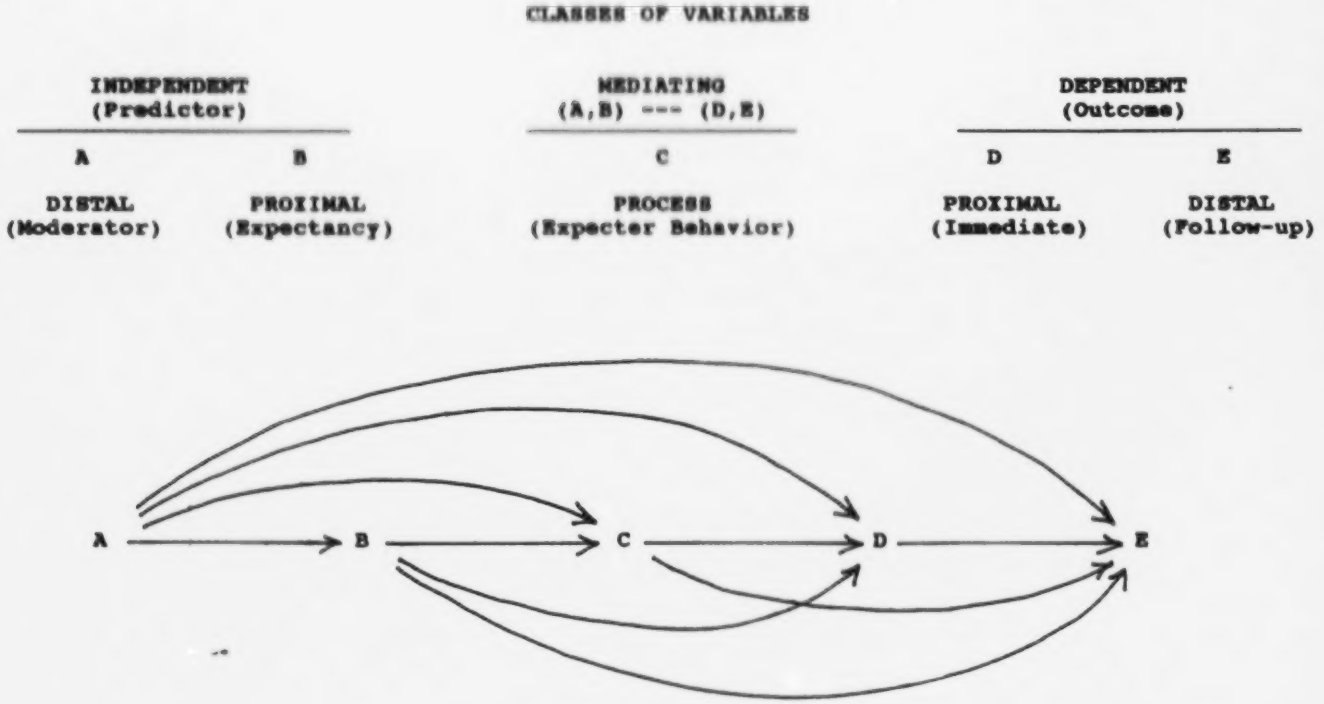

Figure 1. Model for the study of interpersonal expectancy effects.

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